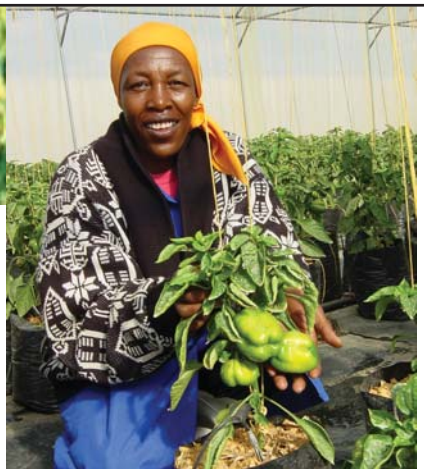
Improving Lives *through*

Agricultural Science and Technology



U.S. Agency for International Development

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"Fifty percent of the improvements in agricultural productivity in the Third World are from improved seed varieties in the last 20 years. Fifty percent! So there's a relationship between science and technology and increasing incomes among poor people in rural areas."

Remarks by Administrator Andrew S. Natsios
U.S. Agency for International Development
Advisory Committee on Voluntary Foreign Assistance
Washington, DC
May 14, 2003

Challenge

More than 800 million people go to bed hungry each night. Of this number, 185 million are preschoolers who are seriously malnourished. Families' incomes are too low and food supplies often run short. Rural populations—including farmers, herders, and fishers—need to raise their incomes by increasing their competitiveness. And they need to take advantage of the opportunities created by local, regional, and global markets and trading networks.

Science and technology are levers for increasing agricultural productivity: increasing yields and protecting them from drought, pests, and disease; lowering costs; and improving food storage and nutritional qualities. Investments in agricultural research and the development and application of a wide range of technologies accelerate the discovery of solutions to agricultural problems.

In developing countries, training and education programs are essential. The next generation of scientists and developers of technologies must be trained so that their innovations can power agricultural production.

The stories that follow illustrate the contributions that science and technology are making to agricultural development. They showcase the results of collaboration between U.S. and developing country scientists as well as other partners in the world science community. They are evidence of how agricultural science and technologies increase food security, incomes, and opportunities.

USAID is proud of its role in ensuring that development assistance makes a difference in the lives of millions of farmers, fishers, herders, and other food producers around the world.

Attacking Poverty through Productivity

Ending hunger and poverty will require more than doubling the current productivity of the land, labor, and water resources of agricultural producers in developing countries.

THAILAND

Appropriate fertilizer use increases yields and income

Yields of hybrid maize are maximized when fertilizer is applied at just the right time and concentration, but how can a farmer determine these? In the past, recommendations on when and how much fertilizer to apply were not tailored to particular soil conditions. Fertilizer compounds available on the local market were limited, and fertilizer spreaders were not adjustable. Too much fertilizer wasted a costly input and contributed to the pollution of local waterways. An insufficient amount of fertilizer meant reduced crop yields. Now, thanks to USAID's Soil Management Collaborative Research Support Program and its researchers at the University of Hawaii, North Carolina State, Texas A&M, and Kasetsart University in Bangkok, Thailand's farmers can test the nutrient status of their fields and determine how best to improve soil quality for specific crops.

With a hand-held computer and a low-cost, portable soil test kit, farmers diagnose nutrient deficiencies and select options for improving soil quality. When they enter data from the soil tests and information on the crop they're growing, the Nutrient Management Support System software estimates potential crop yield for such options as fertilizer type and timing of application. In four provinces, this technology resulted in 10 to 25 percent higher maize yields and up to 50 percent reduction in fertilizer use. The technology enabled farmers to tailor fertilizer applications to local conditions and crops. It also increased yields and profits and reduced excessive fertilizer use and environmental damage.

SOUTH ASIA

"Greener" revolution technologies increase yields

A second, greener "green revolution" is beginning in South Asia, the "breadbasket" and "rice bowl" for more than 1.3 billion people, where hundreds of millions of people derive their livelihoods from farming. From Pakistan, across northern India, through Nepal and Bangladesh, farmers are using new technologies and management practices that reduce weeds and repeated plowing, and that save water and energy.

Using small-scale, locally produced mechanization, the region's farmers are doing less plowing and moving toward "lo-till" agriculture. Irrigation efficiency has increased dramatically, due to increased water penetration and decreased flooding of fields. Water savings range from 30 to 50 percent—amounting to a potential annual savings of 5 billion cubic meters of water. With less land preparation, wheat can be planted sooner after the monsoon rice crop, increasing productivity by a ton or more per acre.

Earlier harvest means farmers can plant profitable and nutritious legumes—after wheat and before rice. This improves soil fertility and makes these foods available and affordable for poor people. Another planting choice is readily marketable oilseeds and vegetables. Crop diversification results in a more robust rural economy and the environmentally sound management of a vital agroecosystem.

Reduced tillage and water use means up to 75 percent less energy is used

Resistant crop varieties eliminate the use of expensive chemicals and provide a technology already familiar to traditional farmers, with reduced labor and at lower cost.

for pumping water and cultivation. Potential reduction in greenhouse gas emissions could reach 800,000 tons of CO_2 per year. Electricity grids are less stressed when farmers pump less water. Less tillage also means fewer weeds, which lightens the burden on women. Herbicide use on larger farms is also sharply reduced.

Perhaps most remarkably, these environmentally significant changes are increasing the incomes of farm families and fostering greater market orientation. Productivity gains in wheat and rice allow farmers to diversify, while reducing costs and making staple foods more affordable.

These changes reflect the contribution of science and technology, within a policy context that rewards farmers and small businesses. Scientists from USAID-supported future harvest centers—CIMMYT (International Maize and Wheat Improvement Center), IRRI (International Rice Research Institute), and the national research programs of South Asia—have developed new, disease-resistant varieties of wheat and rice that produce higher yields in shorter amounts of time. New, short-cycle, high-yielding varieties of iron-rich legumes are doubling and even quadrupling yields, improving diets, and helping reduce anemia. Exciting new research is developing rice varieties that grow in non-flooded conditions, with enormous implications for water conservation. Farmers are responding in ways that save resources and confer major social benefits.

SUB-SAHARAN AFRICA

A parasitic weed meets its match

In dry areas of sub-Saharan Africa, sorghum is a preferred crop for subsistence farmers because of its superior drought tolerance, overall hardiness, and its adaptability to a broad range of conditions. It is a staff of life to over half a billion people.

Still, successful sorghum production is hampered by climatic and biological problems, including the infestation of the parasitic witchweed striga. In many African countries, striga infestation has reached epidemic proportions. In West Africa alone, about 40 million hectares of cereal grain production are severely affected; 70 million more have moderate levels of infestation.

The annual yield losses in the savannah regions of Africa alone are estimated at $7 billion. Despite persistent efforts, control of striga remains a formidable challenge. The witchweed attaches to a host plant and produces a great number of seeds that germinate and cause crop damage before they emerge above ground. Most herbicides have to be applied after significant host plant damage has occurred. Practices such as rotating crops, growing susceptible host plants in infested fields prior to planting the staple cereal, and growing non-host plants that trigger premature striga germination can help, but only if they are all implemented for several seasons. African farmers find these approaches impractical, elaborate, and costly.

Genetic control appears to be a more feasible alternative. Resistant crop varieties eliminate the use of expensive chemicals and provide a technology already familiar to traditional farmers, with reduced labor and at lower cost. With financial support from USAID through the International Sorghum and Millet (INTSORMIL) Collaborative Research Support Program, Purdue University scientists began a novel research program 15 years ago. This research aimed at developing striga-resistant sorghum varieties through close collaboration with African scientists and institutions.

The research unraveled the intricate relationship between striga and the sorghum plant. The chemical compounds produced by the latter that encourage striga germination have been identified and characterized. Laboratory methods were developed for isolating sorghum cultivars resistant to striga. These cultivars produce little or none of the chemical signals that stimulate germination of striga seeds and encourage the attachment of parasitic seedlings to the host plant. The genetic basis of these interactions was sorted out using conventional and molecular approaches, providing alternative mechanisms for genetic intervention.

The approaches identified and developed striga-resistant germplasm adaptable to different African farming systems. A number of these sorghum cultivars have been evaluated in several African countries, in cooperation with their respective national agricultural research services. Striga-resistant sorghum seeds were distributed in Senegal, Mali, Niger, Sudan, Eritrea, Ethiopia, Kenya, Somalia, Rwanda, Tanzania, Zimbabwe, and Mozambique.

Attracting Trade and Investment

Worldwide, levels of foreign trade and investment exceed $9 trillion annually. Connecting to these flows of money and products enables developing countries to fund growth and enhance productivity.

BOLIVIA

Building a new industry in certified wood products

Markets for certified wood products have been developed and new products promoted through the Amazonian Center for Sustainable Forest Enterprise (CADEFOR), a collaborative program of USAID, the Bolivian Sustainable Forestry Program (BOLFOR), the U.S. Forest Service, the World Wildlife Fund, and the Bolivian Chamber of Forest Industries.

Since 2000, CADEFOR has brought together communities and private enterprises to develop mutually beneficial business partnerships. With CADEFOR's assistance, three indigenous communities started profitable partnerships with private industry. Because of improved services, communities have been able to increase wood prices to up to $40 per cubic meter.

CADEFOR is committed to helping the industry achieve new standards of quality and service. It is assisting craftsmen with workshops in design, carving, painting, restoration, and gold plating. Integrated technical assistance is improving administrative and production control systems, cost calculations, marketing skills, sales techniques, and chain of custody certification. To promote usage of alternative tree species, CADEFOR created an online database that includes all information that a manufacturer might need. In the database's virtual trade zone, a potential buyer can find out about availability and a producer can offer a product.

USAID is helping CADEFOR identify and establish markets for future export. Technical assistance aims to improve productivity and efficiency, plant layout, production planning, and use of raw materials. It will also help implement new technology, decrease costs, and reduce waste.

Niche markets for products manufactured from lesser-known tree species will be identified and marketing strategies developed, with the help of the World Wildlife Fund's program and Global Forests Trade Network.

All community groups and companies assisted by CADEFOR will comply with Bolivia's strict 1996 Forestry Law—developed with USAID assistance—which includes sufficient technical standards to promote sustainable forestry. Furthermore, all of CADEFOR's efforts are directed to promoting trade in products that come from forests with third-party certification as "well managed."

NICARAGUA

Organic farming offers new market opportunities

USAID Nicaragua's Natural Resources Management Project brought together seemingly opposite interests to pursue mutual benefits. On one hand, farmers seek sturdy crops that will increase their incomes. On the other, conservationists are committed to the preservation of natural areas and respect for local habitats. By supporting the development of certified organic coffee plantations in the Volcán Mombacho area, the project promoted a partnership between farmers and conservationists that provides a model for other protected zones of Nicaragua.

Through CLUSA Nicaragua, USAID helped establish cooperatives of small and medium-sized farmers who

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practice organic farming rather than the traditional "slash and burn" techniques. Organic farming is not just the absence of pesticides: it is an agricultural system that protects the soil, supports biodiversity, and respects the balance of nature.

The USAID-supported project promotes environmentally sound agricultural methods. It supports training in production, post-harvest quality control, and marketing. It also provides technical assistance in natural pest and disease controls. Farmers learned new strategies for soil conservation and the use of natural compost, and have reduced the amount of polluting chemicals that wash into local streams and rivers.

Improving and assuring high-quality coffee entails managing the entire production process in an integral way. This includes:

- construction, adjustment, or modification of environmentally appropriate demonstration wet mills and coffee drying patios
- establishment of small coffee cupping labs to enable farmers and wet mills to achieve high standards
- short-term technical assistance and training for the management, utilization, and maintenance of wet mills
- alliances between producers, wet mills, and roasters for improved and consistent quality

Though the process is demanding, farmers reap handsome rewards. Currently, certified organic coffee prices are significantly higher than for regular coffee.

ALBANIA

Agrobusiness development

Working with the International Fertilizer Development Center (IFDC), USAID/Albania promoted the development of private agrobusiness enterprises that stimulate widespread and solid economic growth.

Years of isolation and neglect led to the deterioration in the quantity and quality of Albania's production of olive oil. In 1999, over 40,000 poor rural households tended 4 million olive trees on 44,000 hectares of hilly and poor land. Most olive oil produced was consumed at home. Concentrated private sector extension services and a media campaign encouraged farmers to adopt better production, pest management, and harvest and postharvest techniques. The project helped olive oil processors procure top-quality processing lines from Italy and improve their outreach programs, processing, and packaging.

Meeting international standards for extra virgin olive oil required specific improvements in the oil's composition, including reducing its acidity. Within two years, seven processors were marketing 60 metric tons of extra virgin olive oil. This was brought about by a holistic approach to production and processing. Project

staff worked with producers to upgrade quality, and especially on the need for the harvested product to be processed within 24 hours.

Successes due to new technologies and business plans have spilled over to other agribusiness sectors. The first three years saw the development of eight subsector production and processing trade associations. Members of these trade associations represent an average of 75 percent of the market share in each subsector. The trade associations provide members with information on industry developments and new markets, access to credit, trade missions and fairs, and training in technical subjects.

Improving Health through Food-Based Solutions

Improvements in food quality and quantity are crucial to ending malnutrition and reducing the high incidence of death, illness, and poor growth of children in developing countries.

UGANDA

Crop biofortification combats vitamin A deficiencies

In Uganda, orange-fleshed varieties of sweet potato provide an important source of vitamin A. Sweet potato varieties with high concentrations of betacarotene, a precursor to vitamin A, were developed at the International Potato Center (CIP) in Peru. They are being distributed through the VITAA (Vitamin A for Africa) Partnership, with support from USAID.

Since July 2002, more than 850,000 cuttings of orange-fleshed sweet potato vines have been delivered to farmers in war-torn regions of northern Uganda. The contribution of this crop to the nutrition of malnourished children and pregnant mothers in displacement camps cannot be overemphasized, say local officials. The new, more nutritious varieties of sweet potato are also being adopted by farmers in other regions of Uganda.

Vitamin A deficiency is one of the most prevalent nutritional problems in sub-Saharan Africa. The World Health Organization estimates that between 100 and 140 million children suffer from vitamin A deficiency. As a result, every year 250,000 to 500,000 children go blind, and about half of this number die.

Orange-fleshed sweet potatoes are one of the most promising plant sources of betacarotene. Sweet potato varieties commonly grown in sub-Saharan Africa have white flesh and no betacarotene. Plant breeders from CIP and VITAA have worked to produce an orange-fleshed variety that has the texture and moisture characteristics preferred by African consumers. An impact study by economists at Michigan State University and CIP estimates that these new cultivars could benefit an estimated 50 million African children under 6 at risk from diseases associated with vitamin A deficiency.

WEST AFRICA

Reducing human health impacts of aflatoxins

Aflatoxins contaminate many foods, including peanuts, maize, and other grains. These toxins are produced when certain fungi attack plants. The impact of human exposure to aflatoxins is under study, but so far has been linked to immune system suppression, interference in protein nutrition, and an increased risk of liver cancer in people carrying the hepatitis B virus. In animals, aflatoxin exposure can cause reduced growth, liver cancer, reduced immunity, cirrhosis, and death. In West Africa, signs of aflatoxin exposure are commonly found in human blood serum. This may be attributed to a diet largely composed of maize and peanuts, the region's high humidity, and difficulties of drying and storing produce.

A research program funded by USAID through the Peanut Collaborative Research Support Program found that the impact of aflatoxin on human and animal health can be significantly reduced by adding very small amounts of an aflatoxin-binding clay to animal feed and human food products. All other solutions to aflatoxin so far have involved much more costly technologies. This new technology now treats 10 percent of all commercially produced animal feeds worldwide. Research continues on the addition of this clay to human food products.

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GHANA

Improved infant food reduces malnutrition

An easy-to-cook mixture developed from Africa's indigenous crops by researchers at the University of Georgia and the University of Ghana is improving the nutrition of young children. The mixture of cowpeas, peanuts, and corn is being promoted as an alternative to the cereal-based foods typically given to newly weaned children.

Lacking important nutrients, the cereal diet often leads to swollen stomachs and hair loss—visible signs of malnutrition. Malnutrition has become so common in some parts of rural Ghana that the local translocation of the word "malnutrition" means "the disease a child gets when a younger child is born."

The research effort included the development of mills to process cowpeas into flour and consultations with local women about the appearance, color, and texture of the food. The ease of preparation was a big selling point for overworked rural women: only hot water is required. Observers have noted improvements in the health of newly weaned children in villages where the food has been introduced.

Child malnutrition extracts a heavy toll on Ghanaian families. Despite a steady decline in under-5 mortality since the 1960s, child deaths are still unacceptably high. Approximately 60 percent of child mortality is due to malnutrition. Finding food-based solutions to reduce malnutrition continues to be a focus of USAID activities in Ghana and around the world.

Investing in People

Today, scientific and technical capacity is the key to a nation's ability to compete globally and manage the development of its human resources.

INDIA

Connecting people and institutions reduces hunger

Among other activities, the Collaborative Agricultural Biotechnology Initiative (CABIO) is mobilizing new science and technology to reduce poverty and hunger through human and institutional capacity building. Under the initiative, new linkages and collaborative training are connecting developing country institutions with U.S. and other international research institutes to broaden intellectual, government, and business relationships, and give developing countries access to new technologies and expertise.

This is new capacity—both in the technology itself and in the enabling policy framework that includes biosafety, intellectual property rights, and technology transfer. Biosafety regulatory systems and intellectual property rights play a crucial role in access to, and safe use of, modern biotechnology.

Jointly hosted scientific conferences are examining opportunities for collaboration in agricultural biotechnology. India is the first country to establish an independent Department of Biotechnology under the Ministry of Science and Technology. The most recent conference, jointly hosted by this department and USAID, launched a long-term collaborative agricultural biotechnology program in India. The Indian government has decided to set up an institutional framework for promoting research on and applications of transgenic crops.

CAPACITY BUILDING IN AGRICULTURE AND RURAL DEVELOPMENT

USAID has long supported the training of scientists in fields relevant to agriculture and rural development. Agricultural scientists from the developing world who earn their graduate degrees in the United States later play key roles in accelerating development. It is through such scientists that developing countries gain access to advanced technologies of all kinds.

Reversing a recent decline, USAID has committed to reestablishing its position as a global leader in long-term training of agricultural scientists, technicians, and policymakers from developing countries. This commitment will build the capacity of developing country institutions. Recommendations by the Board for International Food and Agricultural Development (BIFAD) guide these new investments. Along with traditional U.S. university-based degree programs, USAID is considering innovative capacity-building programs in Mali, Mozambique, and Uganda.

ZAMBIA

Capacity building increases incomes and protects natural resources

Though many farmers in eastern Zambia are facing serious food shortfalls, about 12,000 who took part in a USAID-sponsored agroforestry program are still growing their own grain and have enough left over to sell. The program, a collaboration of the World Agroforestry Center and World Vision, works with farming families to

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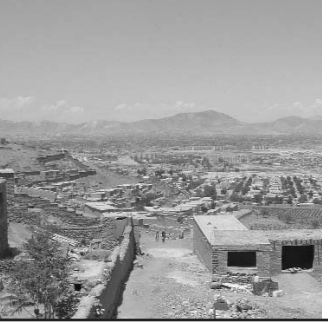
diversify crops and improve soil conditions through the application of agroforestry technologies. Families have learned that planting soil-replenishing trees and shrubs during fallow years can lead to increased soil fertility and water-use efficiency. The practice also increased maize production and household food security. Conservation tillage, mulches, and appropriate cover crops have improved soil fertility, reducing the need for expensive inorganic fertilizers. Better storage methods have also reduced losses. With yields increasing, farmers no longer need to cut down forests to obtain fertile land for their crops. Thus, these technologies have important environmental as well as economic and productivity benefits. Because extension agents have been trained in agroforestry technologies, the program's reach will continue to grow.



Ending Famine

Famine is a completely preventable tragedy—with the right policies, including early warning systems, flexible response mechanisms, broad engagement from traditional and nontraditional donors, and sound policies in the countries most at risk.

AFRICA

Famine can be prevented with early warning

Much of sub-Saharan Africa faces natural and man-made threats that could lead to famine. While some crises come without warning, anticipated and gradually unfolding natural disasters often provide decisionmakers ample time to take preventive action. USAID's Famine Early Warning Systems Network (FEWS NET) helps countries reduce the risk of or prevent the food insecurity that can lead to famine. With timely information and analysis from FEWS NET, policymakers can better manage food insecurity risks. FEWS NET focuses on empowering people to find their own solutions, primarily through strengthening the quality and effectiveness of food security information systems and networks. The outcome will be policies, programs, and strategies that reflect the best available information and analysis.

FEWS NET offers a range of tools and services. These include regular food security updates and briefings that draw upon remotely-sensed and ground-based data. They also include vulnerability assessments that help policymakers understand the effects of potential shocks—such as droughts, floods, and crop and livestock diseases—on particular groups and households.

With information supplied by FEWS NET, governments are mobilizing their own resources to address impending risks to food security. Additionally, when FEWS NET reports indicate the risk of food insecurity cannot be handled by the national government, the international community can be called upon to provide the assistance necessary to avert a famine.

EAST AFRICA

Early warning prevents loss of livestock

In East African pastoral communities, livestock provide financial, food, and social security. In recent years, the weather has not been kind to these

communities. Large-scale losses of livestock have forced many pastoralists to rely on food aid. Traditional coping mechanisms have been eroded due to the increased frequency of drought, flooding, and conflict, coupled with inefficient markets, resource deterioration, and encroachment of farming into traditional grazing lands.

New approaches are needed to address the food and income insecurity these communities face. The Livestock Early Warning System (LEWS), sponsored by USAID's Global Livestock Collaborative Research Support Program and directed by Texas A&M University, is one promising new approach.

LEWS provides communities, regional offices, and national governments with information they

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need to better manage livestock. In the pastoral areas of Ethiopia, Kenya, Tanzania, and Uganda, herders can receive timely information on forage conditions on inexpensive computers. Special advisories are issued every 10 days, with maps and forecasts distributed via the WorldSpace satellite radio network on the African Learning Channel. Through an array of communication nodes, information is distributed to over 400 key decisionmakers, including district officers.

LEWS consistently provides early warning of emerging forage conditions 90 to 180 days ahead, enabling pastoral communities to move animals to alternative grazing areas. Cellphone SMS messaging systems at key livestock markets are now being integrated into the automated system to provide pastoral communities with more options for marketing their animals.

AFGHANISTAN

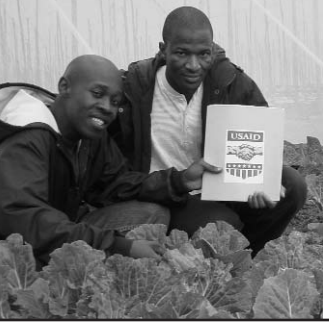
Improving food security by rebuilding agricultural systems

Assisting Afghanistan in redeveloping a functional agricultural economic base is the goal of the Future Harvest Consortium to Rebuild Agriculture in Afghanistan. This USAID-funded effort is led by International Center for Agriculture Research in Dry Areas (ICARDA).

Agriculture is the largest and most important sector of the Afghan economy. Before 1979, Afghanistan was self-sufficient in food production, and it exported fruits, nuts, wheat, cotton, and livestock products. However, years of conflict and the worst drought in memory have devastated the country's food production capacity and impoverished farmers. Less than 6 percent of the country is in production today. Large numbers of orchards, vineyards, and irrigation systems have been destroyed, and the countryside is still heavily mined. The land shows signs of serious soil degradation, overgrazing, deforestation, and desertification. Wells are dry, millions have no access to clean water, and the roads connecting farmers to markets have been badly damaged or destroyed.

The Future Harvest Consortium to Rebuild Agriculture in Afghanistan combines relief with research and development. The scientists are developing, testing, and distributing drought-resistant crop varieties and production technologies. Afghans have been trained in seed technology and pest control. A "code of conduct" has also been developed to provide a regulatory framework for seed production and protect local genetic resources. The effects of drought, pests, and disease are being addressed by increasing crop diversity. Farmers also receive training and information on fertilizer and water application.

What is unique about the consortium's work is that science is placed up front in the recovery effort. Interventions are technically and locally appropriate, based on an understanding of Afghan agriculture and the needs of rural communities. Science and technology-led recovery efforts, supported by grassroots interventions, will build a solid foundation for the recovery of Afghanistan's agriculture.



USAID's Commitment

Advances in science and technology hold enormous promise for all those engaged in agricultural activities. Progress in the agricultural sciences was felt in Asia and Latin America, when high-yielding, pest-resistant modern crop varieties raised productivity. Adoption of these varieties is now expanding in Africa.

USAID believes that the enormous challenge of meeting the world's food needs depends on harnessing the benefits of scientific and technological innovations. These benefits include achievement of optimum efficiency in agricultural production and marketing; improved information, communication, and outreach systems; and environmentally sound agricultural and natural resources management.

USAID also believes in supporting a collaborative environment that fosters scientific and technological innovation. Developing country scientists should be equal participants in the science and technology community, and developing country practitioners should direct new technologies in locally appropriate directions.

Bridging the knowledge divide is a central component of USAID's science and technology activities. The growth of new information and communication technologies over the past 20 years has changed the norms for trade, commerce, and communication. Formerly isolated communities have taken advantage of new technologies to increase access to markets.

New information and communication technologies are also linking up existing extension services, harnessing the skills of agents to promote literacy, and aiding the effort to provide expert technical and financial advice about the business of farming. But technologies alone are not sufficient. To make agricultural growth even better, USAID is revitalizing its support for a range of training programs in the agricultural sector.

With the majority of people in the developing and transition countries continuing to derive their livelihoods from agricultural and related enterprises, the transformation of agriculture and food systems is an essential aspect of broad-based economic growth and a critical component of USAID's work to reduce poverty and food insecurity around the world. In carrying out its agricultural programs, USAID and its

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partners must take into account the new global context and build on the comparative advantage that the United States offers in the agricultural sector, including its premier position in global competitiveness as well as scientific and technological capacity.

Over the next 20 years, USAID is committed to:

- working with partners to expand global and domestic trade opportunities
- improving the capacity of farmers and rural industries to act on them
- promoting sustainable agriculture
- mobilizing science and technology to reduce poverty and hunger
- bridging the knowledge divide through training and education, outreach, and adaptive research

Definition: Agriculturalists includes farmers, herders, and livestock producers, individuals who fish and others employed in cultivating and harvesting food resources from salt and fresh waters, individuals who cultivate trees and shrubs and harvest nontimber forest products, as well as the processors, managers, teachers, extension specialists, researchers, policymakers, and others who are engaged in the food, feed, and fiber system and its relationships to natural resources.

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